

Appendix B

Appendix B. Data Collection and Estimation Methods Used for Commercial Fishing and Recreation Industry Use of the Channel Islands National Marine Sanctuary

Appendix B

Forward

The documentation of data collection methods presented here is part of the ongoing work being conducted by the Socioeconomic Panel for the Channel Islands National Marine Sanctuary (CINMS). CINMS is in the process of updating its five-year management plan. The creation of marine reserves is one of the major issues being addressed in the five-year management plan revision. The Socioeconomic Panel was formed to provide information and analyses to the Marine Reserve Working Group (MRWG) of the Sanctuary Advisory Council (SAC) of the CINMS. The MRWG is comprised of a broad group of stakeholders and was charged with the task of designing and forwarding a consensus based alternative for marine reserves in the CINMS.

The Socioeconomic Panel consists of the following individuals:

Dr. Vernon R. (Bob) Leeworthy
Socioeconomic Panel Leader
NOAA/NOS/Special Projects
1305 East West Highway, SSMC4, 9th floor
Silver Spring, MD 20910
Telephone: (301) 713-3000 ext. 138
Fax: (301) 713-4384
E-mail: Bob.Leeworthy@noaa.gov

Peter C. Wiley
Economist
NOAA/NOS/Special Projects
1305 East West Highway, SSMC4, 9th fl
Silver Spring, MD 20910
telephone: (301) 713-3000 ext. 139
fax: (301) 713-4384
e-mail: Peter.Wiley@noaa.gov

Dr. Caroline Pomeroy
Institute of Marine Sciences
Earth & Marine Sciences Bldg., A 316
University of California
Santa Cruz, CA 95064
Telephone: (831) 459-5614
Fax: (831) 459-4882
E-mail: cpomeroy@cats.ucsc.edu

Dr. Craig Barilotti
Sea Foam Enterprises
4369 Osprey Street
San Diego, CA 92107
telephone: (619) 223-9335
fax: (619) 223-9611
e-mail: seafoam@mindspring.com

Dr. Charles Kolstad
Department of Economics
North Hall 2127
University of California
Santa Barbara, CA 93106
Telephone: (805) 893-2108
Fax: (805) 893-8830
E-mail: kolstad@econ.ucsb.edu or ckolstad@sbceo.org

Appendix B

Introduction

This report documents the data sources and methods used to estimate the both the total amount of usage and the spatial distribution of usage of the Channel Islands National Marine Sanctuary (CINMS). This information was developed by the Socioeconomic Panel that was created to support the Marine Reserve Working Group (MRWG) of the Sanctuary Advisory Council (SAC). The MRWG was charged with designing and forwarding a consensus recommendation for marines reserves (no take areas) within the CINMS. Usage here meaning the commercial fishing catch and the ex vessel value of the catch (i.e., what the fisherman receives for his catch) and the number of person-days of recreation activity. Maps and tables summarizing the information can be found in “Data Distributions and Exclusion Zones: Commercial Fishing – Recreation” (Leeworthy and Wiley, 2001a). This report has been commonly referred to as the “Binder”.

Commercial Fishing

Contractors. Two contractors were selected by NOAA to gather information for the commercial fisheries in the CINMS. Criteria for selection were that commercial fishermen had personal knowledge of the contractor and would trust the contractor with access to proprietary information. In addition, the contractor had to be considered to be neutral and acceptable to NOAA as an objective researcher.

NOAA selected Dr. Craig Barilotti of Sea Foam Enterprises, Inc. located in San Diego, California for the contract to collect information from all commercial fisheries, except squid and wetfish (e.g., anchovies, sardines and mackerel). For squid and wetfish, Dr. Caroline Pomeroy of the University of California-Santa Cruz was selected. Dr. Barilotti had formerly worked for Kelco (now ISP Alginates) the only harvester of kelp in the CINMS. Dr. Barilotti also was involved in developing stock assessment information for red urchins. Dr. Pomeroy had an ongoing Sea Grant-sponsored study of the changing social and economic organization of the squid fishery (R/MA-39, with Co-PI Margaret FitzSimmons). Both contractors had developed significant knowledge and working relationships with the commercial fishermen in the region of study. NOAA ran the contracts through a contract with Tetra Tech, which was hired to support a variety of activities associated with CINMS’s five-year management plan revision. Both contractors, by the nature of their work, became part of the Socioeconomic Panel.

Questionnaires. NOAA provided both contractors with Office of Management and Budget (OMB) approved questionnaires to guide the data collection (OMB Approval #: 0648-0408, expiration date: 6/30/2003). The questionnaires were designed to be flexible across applications in different regions and in different fisheries. This afforded some latitude to each contractor in modifying the questionnaire to accomplish the general information requirements. Because of the ongoing work by Dr. Pomeroy in her Sea Grant-sponsored project, the socioeconomic data from the squid/wetfish fishery is more detailed than that obtained by Dr. Barilotti.

Maps and Coding Sheets. NOAA provided maps and coding sheets and formats for how data on catch/ex vessel value would be recorded and entered into databases. Catch/ex vessel value was to be obtained from each fisherman in 1-minute by 1-minute grid cells within the 22 10-minute by 10-minute California Department of Fish and Game (CDFG) blocks that were selected as best approximating the CINMS. CDFG uses 10-minute by 10-minute blocks to organize commercial fish catch/ex vessel value from the fish ticket reporting system. Maps were developed from NOAA nautical charts that provided necessary details for reference points to assist fishermen in identifying the location of their catch. The 1-minute by 1-minute grid cells were overlaid on the nautical charts. Each grid cell was numbered for data recording and database construction.

Databases/GIS. Contractors were instructed to deliver catch/ex vessel distribution information in Excel spreadsheets. Excel spreadsheets were then easily read into the Archview Geographic Information System (GIS) for further processing and analysis.

Appendix B

Squid/Wetfish Fisheries-Pomeroy Sample

In late April 2000, Dr. Pomeroy and three project team members (D. Reese, M. Hunter and M. Los Huertos) began work. The team developed two survey instruments (within the purview of the OMB Approved instruments provided by NOAA), one each for catcher vessels (purse seiners) and light boat skippers. Protocols appropriate for the squid fishery were also developed. The team met (by phone and in person) with key members of the squid fishery to solicit their input and feedback on the instruments and protocols, to secure their participation, and to gain their support for the study and their help in bringing others from the fishery's diverse membership on board. In addition, permission was secured, under a strict confidentiality agreement, to use landings data from the Pacific Fisheries Information Network (PacFIN) database, maintained by the Pacific States Marine Fisheries Commission, to complement the data to be collected through interviews.

Dr. Pomeroy's knowledge of the fishery and its participants (including that acquired through extensive ethnographic fieldwork), the PacFIN database, the CDFG squid permittee list, and squid industry participants' input to develop a list of participants in the CINMS squid fishery. In mid May, the survey instruments were pre-tested and refined. Data was then collected over the ensuing six weeks.

The data collection worked as follows: fishermen were contacted (usually on the dock) and provided with an information package. The information package included: 1) a cover letter explaining the study and its relationship to Dr. Pomeroy's ongoing study of the statewide squid fishery. The cover letter also asked for permission to draw upon the ongoing study information already collected for the current application to the CINMS., 2) a draft schedule of the CINMS process, 3) a sub-set of socioeconomic questions, and 4) a set of maps with a request that fishermen think about where they caught squid and other species around the CINMS between 1996 and 1999. Fishermen were asked to review the information provided and to consider participating in the study. Fishermen were encouraged to contact Dr. Pomeroy with any questions or concerns then contacted the following day (or soon after) to secure their participation and to set up a convenient time to meet and complete the interview. Overall, 37 interviews were completed. These included interviews with 29 purse seine skippers and 8 light boat skippers. One of the light boats was also classified as a scoop or brail boat.

Data collection required extensive fieldwork, involving face-to-face contact with fishermen on the docks in San Pedro, Ventura, Monterey and elsewhere. Although good coverage was achieved in terms of the percent of total catch/ex vessel revenue, the sample is probably not representative of the entire fleet in terms of socioeconomic characteristics. Fishermen involved in the CINMS squid fishery are involved in fisheries from San Diego to Alaska. During the survey period, it was not possible to reach many of these fishermen (especially those from out of state). Data from Pomeroy's Sea Grant-sponsored project afforded a more representative sample of the fleet for socioeconomic characterization. Comparisons were made on several key socioeconomic characteristics. There were not significant differences in investment in boats and equipment, but there were differences in where the fishermen come from and our samples accounted for a higher proportion of catch/ex vessel value.

Distribution of Catch/Ex Vessel Value. Fishermen first marked on the maps the places where they fished. The 1-minute by 1-minute grids were then overlaid on the maps. The fishermen were then asked to assign points to each cell where they indicated they caught fish (e.g., squid/wetfish/tunas/other species). Points were assigned as follows: for each fisherman, cells that covered less than or equal to 50% were set equal to 0.5. Cells that covered greater than 50% were coded equal to 1. Cells not covered were coded zero. For each fisherman, a normalized distribution (i.e., one that summed to 100 percent across all cells) was created. To aggregate across sampled fishermen required weighting for catch/ex vessel value using the average reported catch/ex vessel value for 1996-1999 from PacFIN for each fisherman. This provided a normalized percentage distribution across all cells in the study area (again, normalized percentage adding to 100 percent across all fishermen and all cells).

MAP Generation. Two maps were generated. One based on the information provided by the purse seiners and one based on the information provided by the light boat operators. In July 2000, the two maps were presented to the fishermen in San Pedro. The fishermen unanimously approved the map based on the light

Appendix B

boat operators' input as the more accurate of the two and requested that this map be used by the MRWG representative to depict their fishery to the MRWG.

The next task was to assign ex vessel value to the map. Dr. Leeworthy obtained catch and ex vessel value for years 1988 to 1999 from CDFG. The Socioeconomic Panel had decided early in the project that the 1996-1999 annual average of ex vessel value would be used for prospective analysis, since this four year average captured the variability of catch and ex vessel value. Data from CDFG for 1996 however was incorrect. PacFIN sources reported much different ex vessel value for 1996, although the same quantity of catch. Our 1996-1999 annual average for ex vessel value was revised from \$11 million to \$13 million based on PacFIN revisions to the 1996 ex vessel value (personal communication, Will Daspit, Pacific State Marine Fisheries Commission). The 1996-1999 estimated annual average from PacFIN was \$13,046,664. This amount was distributed to each 1-minute by 1-minute grid cell according to our sample-normalized distribution. Our sample of squid fishing operations accounted for 21.89% of the squid fishing operations that operated in the CINMS, but accounted for 95.15% of the ex vessel value of squid caught in the CINMS.

The same procedures used for squid were followed for wetfish (anchovies, sardines and mackerel) and for tunas. The original contracts with Dr. Barilotti and Dr. Pomeroy did not include the tuna information from Dr. Pomeroy. However, after reviewing the data, the Socioeconomic Panel decided the "best" information on tunas came from the Pomeroy sample. Maps were also developed for "Other Species" caught by the squid/wetfish sample. These maps were developed for the purpose of analyzing impacts on individual fishing operations rather than for entire fisheries since they would include double counting across fisheries.

Summary. Three maps were developed from the squid/wetfish fisheries that are used in the socioeconomic impact analyses. Ex vessel value was chosen for map generation and placed in the Archview GIS for analysis. The 1996-1999 annual average of ex vessel value was mapped for each of the three maps. For squid, the 1996-1999 annual average ex vessel value was \$13,046,664. For wetfish (anchovies, sardines and mackerel), the 1996-1999 average annual ex vessel value was \$301,486. For tunas, the 1996-1999 average annual ex vessel value was \$305,665.

For squid, our samples accounted for 21.89% of the squid vessels operating in the CINMS and over 95% of the ex vessel value of catch from the CINMS. For wetfish, our sample accounted for 54% of the fishing vessels operating in the CINMS and 84.48% of the ex vessel value of catch from the CINMS. For tunas, our samples were somewhat weaker. The sample of tuna vessels accounted for 36.84% of the tuna vessels operating in the CINMS but only 13.62% of the ex vessel revenues from the CINMS. Maps and tables summarizing a comparison of the 1999 population and sample distributions for each fishery, in terms of fishing operations (vessels) and ex vessel value of catch are provided in (Leeworthy and Wiley, 2001a).

All Other Species/Species Groups-Barilotti Sample

In late April 2000, Dr. Barilotti and two project team members began work. Dr. Barilotti first assembled a group of fishermen and pre-tested the NOAA supplied, OMB approved questionnaire with the fishermen. The questionnaire was modified within the purview of the OMB approved questionnaire. The fishermen formed a Fishermen's Data Committee (FDC). The FDC wanted to be able to review all data and maps and provide approval before any maps could be shown to the MRWG. The FDC decided that individual maps of species/species groups could not be shown to the public. The maps could be shown to the MRWG in closed working sessions, but had to be collected at the end of each working session. The map data could be entered into Archview GIS and be used by the Socioeconomic Panel for analysis, but the electronic database or paper maps could not be accessed by the Science Panel.

At the fishermen's first meeting, they decided not to provide individual catch information. The fishermen wanted to first produce what came to be called the Exclusion Zone maps. Exclusion zones were places in which the fishermen did not want marine reserves (no take areas). The data collection maps with the 1-minute by 1-minute grid cells were colored in for cells in which the fishermen did not want marine

Appendix B

reserves. This was done for crabs, sea cucumbers, kelp, live fish or near shore rockfish, spiny lobster, Nets(swordfish, seabass, halibut and shark, prawn, and urchin. A total map was also created which simply summed the number of species/species groups from the individual species/species group maps for each grid cell. This mapped data was sent to NOAA and entered into the Archview GIS. Maps were produced and sent back to the FDC for approval to be distributed to the MRWG. The FDC made these maps available to the public.

The fishermen were informed that the Exclusion Zone maps would not be adequate for the socioeconomic impact analyses. Fishermen were organized in group meetings to fill in individual maps for each species/species group they caught in the CINMS. Fishermen were uncomfortable meeting in the groups when providing individual information as each attempted to conceal their information from other fishermen. Fishermen did not want to reveal their individual fishing locations to other fishermen. All future data collections were done one-on-one with project team data collectors.

Data was collected to support the development of 11 species/species group maps. The kelp map was developed from data provided by Dale Glantz of ISP Alginates (the sole harvester of kelp in the CINMS). Other maps included urchin, spiny lobster, rockfish, prawn, crab, CA sheepshead, flatfish, sea cucumber, sculpin & bass and shark. The Barilotti sample included 59 fishermen. Most of the fishermen caught multiple species/species groups. The Barilotti sample was not adequate for rockfish, prawn and crabs. For these species/species groups, CDFG 10-minute by 10-minute data combined with the exclusion zone maps were used to derive distributions at the 1-minute by 1-minute spatial resolution. This will be described below.

Distribution of Catch/Ex Vessel Value. The data collection followed similar procedures used in the squid/wetfish fisheries. One-on-one meetings were set-up with fishermen. Maps and questionnaires were filled out working with the project team. A different scoring system was used in the Barilotti sample. Each fisherman was given a 50-point budget. Each fisherman was asked to assign a number of either 1 or 2 to each map cell for each species/species group. The number 2 indicating they caught more of their catch in that cell. Very few actually assigned a value of 2 to any one cell. Many went over their budget of 50 because they fished in many more cells. The scores were all normalized to 50 for each fisherman, then normalized to 100 percent across cells. As with the Pomeroy sample, the distributions were weighted by individual catch/ex vessel value. Each sampled fisherman was asked to sign an affidavit that gave Dr. Barilotti access to CDFG trip ticket and logbook information on each fisherman. Weighted distributions for each species/species groups were then produced. Percentage distributions that add to 100 percent across all cells were produced.

Map Generation. As with the squid/wetfish fishery, the 1996-1999 annual average ex vessel value for each species/species group was distributed across the 1-minute by 1-minute grid cells in Archview GIS. The maps were then sent then presented to the FDC for review and approval. As noted above, these maps are not available in (Leeworthy and Wiley, 2001a) because the FDC would not allow access to the public or the Science Panel. The maps and data were only made available to the Socioeconomic Panel for analysis and to the MRWG in closed sessions.

As noted above, for rockfishes, crab and prawn, the sample distributions were not completely adequate. For rockfish, we had good distribution information west of 119 degrees 50' West Longitude. The sample contained no information east of this point. We used the sample distribution for the western portion and the CDFG 10-minute by 10-minute block data along with the Exclusion Zone maps for the eastern portion. For the eastern area, the ex vessel value for each 10-minute by 10-minute block was distributed to the 1-minute by 1-minute cells equally for each cell in the 10-minute by 10-minute block that was included in the Exclusion Zone map. The CDFG 10-minute by 10-minute block data confirm what our sample revealed, i.e., that the eastern area of the CINMS is relatively unimportant for rockfish. The 1996-1999 average annual ex vessel value for rockfish was \$507,758 for the western area and \$41,561 for the eastern area.

For crab, we followed the same procedure as for rockfish for the western area. For the eastern area, Exclusion Zone information was not available. We distributed the CDFG 10-minute by 10-minute block totals to the 1-minute by 1-minute cells within each 10-minute by 10-minute to those cells within three

Appendix B

miles from shore (the pattern in the western area). As with rockfish, the CDFG data confirm that catch of crabs from the eastern area of the CINMS is relatively small. The 1996-1999 average annual ex vessel value for the western area was \$304,029 and \$39,565 for the eastern area.

For prawn, there were only three fishermen in our sample. We used the CDFG 10-minute by 10-minute block totals and distributed these totals within the 10-minute by 10-minute blocks evenly to the 1-minute by 1-minute cells included in the Exclusive Zone maps. Prawn distributions extend out to the edges of the CINMS and into blocks outside our 22-block definition of the CINMS. We accounted for this by taking the data from CDFG block 690 and distributing its total to the 1-minute by 1-minute Exclusion Zone cells in 690, 671 and 672. Also, data from CDFG block 711 was distributed to the 1-minute by 1-minute cells in CDFG blocks 711 and 730.

Summary. The Barilotti sample included 59 fishing operations and accounted for 25 percent of the 1996-1999 average annual ex vessel value of catch from the CINMS. Together with the Pomeroy sample, our two samples included 96 fishing operations which represent 13 percent of the fishing operations that fished in the CINMS, but accounted for 79 percent of the total ex vessel value of catch from the CINMS.

Species/Species Groups Not Mapped at the 1-minute by 1-minute Resolution or Not Mapped

The following table summarizes the other species/species groups either not mapped at the 1-minute by 1-minute cell resolution or not mapped at all and the percent of ex vessel value each species/species group accounted for over the 1996-1999 period. All these species/species groups accounted for less than 1.5 percent of the total ex vessel value from the CINMS, including abalone. Abalone has not been commercially harvested since 1997 in the CINMS. Excluding abalone, these species/species groups accounted for only a little over one half of one percent of the total ex vessel value from the CINMS.

Species/Species Group	1996-1999 Avg. Value	Percent of CINMS
Abalone	178,027	0.878273 mapped at 10 by 10 mile
Swordfish	39,090	0.192845 mapped at 10 by 10 mile
Roundfish	33,262	0.164094 mapped at 10 by 10 mile
Other	22,990	0.113418 mapped at 10 by 10 mile
Yellowtail	6,891	0.033996 mapped at 10 by 10 mile
Shrimp	5,813	0.028678 mapped at 10 by 10 mile
Mussels, Snails	4,694	0.023157 mapped at 10 by 10 mile
Salmon	1,411	0.006961 mapped at 10 by 10 mile
Rays & Skates	1,164	0.005742 mapped at 10 by 10 mile
Surf Perch	695	0.003429 not mapped
Grenadiers	211	0.001041 not mapped
Octopus	196	0.000967 not mapped
Total	294,444	1.452601
Total, Excluding Abalone	116,417	0.574328

Appendix B

Recreation Industry

The Recreation Industry data included information organized into consumptive and nonconsumptive activities and within each of these categories whether the activity was done from a charter/party boat or guide service (for hire operation) or from a private household owned boat. The charter/party boat or guide service activity was obtained through a contract with Dr. Charles Kolstad of the University of California – Santa Barbara. Dr. Kolstad was able to obtain a census i.e., all operators that operated in the CINMS in 1999. Dr. Kolstad's team used a NOAA provided OMB Approved questionnaire (OMB Approval #: 0648-0408, expiration date: 6/30/2003). Information was obtained on person-days of activity, by activity type along with revenues, operating and capital costs and profits associated with each activity. Person-days of activity, by type of activity, were mapped in 1-minute by 1-minute cells for all the cells in the CINMS. For private household boat use data was obtained from multiple sources which will be explained below.

Charter/Party Boat or Guide Service – For Hire Operations

A total of 51 operators of charter/party boat or guide services were identified as having operated in the CINMS in 1999. Operators often engaged in providing multiple activities, sometimes both consumptive and nonconsumptive activities. Therefore, the addition of the number of operators across activities will add to more than 51. Person-days of activities, revenues, costs and profits are not double counted across activities.

Nautical charts with the 1-minute by 1-minute cell grid overlaid were provided to the Kolstad team by NOAA. Dr. Kolstad used students at UC-Santa Barbara to collect the information. The students went to the offices of each operation to collect the information. Person-days of activity, by type of activity, were mapped for each operation and entered into Excel spreadsheets. Excel spreadsheets were then entered into the Archview GIS for each operation. Person-days of activity, by type of activity, were then summed across operations. Since a census of operations was achieved, the sum of the sample represents the population estimate.

Charter/Party Boat Fishing. In 1999, there were 18 operators that accounted for 158,768 person-days of fishing in the CINMS.

Charter/Party Boat Consumptive Diving. In 1999, there were 10 operators that accounted for 17,935 person-days of consumptive diving in the CINMS.

Charter/Party Boat Whale Watching. In 1999, there were 8 operators that accounted for 25,984 person-days of whale watching in the CINMS.

Charter/Party Boat Non-Consumptive Diving. In 1999, there were 7 operators that accounted for 10,776 person-days of non-consumptive diving in the CINMS.

Charter/Party Boat Sailing. In 1999, there were 8 operators that accounted for 4,015 person-days of activity in the CINMS.

Guide Service for Kayaking/Island Sightseeing. In 1999, there were 4 operators that accounted for 1,233 person-days of kayaking/island sightseeing in the CINMS.

Private Household Boat Use Estimation

The data distribution for private household boat fishing and consumptive diving in the marine reserves study area was estimated in three steps.

The **first step** involved compiling and incorporating all of the existing geo-referenced data sources for private boat usage in the study area. Data was incorporated from the following sources:

Appendix B

- Recreational Fisheries Information Network (RecFIN). These data include a sample of anglers in the Southern California Region. Data elements include mode, gear, annual person days and species as well as the geographic coordinates of activity. The sample was not sufficient to provide a dense enough coverage of the study area to be the sole data source, however it did provide a rough distribution and also much needed parameters such as the breakdown of gear usage (e.g. hook and line, diving (e.g. spearfishing), etc.).
- The Sanctuary Aerial Monitoring Spatial Analysis Program (SAMSAP). This is an Aerial Survey conducted by sanctuary personnel, which, among other things, provides geo-referenced point data broken down by boat type. Boat categories include “recreation,” which is defined as private boats. The assumption was used that the breakdown between fishing and consumptive diving is the same as the RecFIN sample. The sample was also not of a sufficient size to be used as a sole distribution data source.
- Channel Islands National Park (anchorage data). This data was from a program of visitor statistics compilation conducted by National Park Rangers. The data collection includes a breakout of data for private vessels in the National Park anchorages. Park staff use a multiplier of 5.5 persons per private vessel (for private boats). Again, the assumption was used that the breakdown between fishing and consumptive diving is the same as the RecFIN sample.
- Yacht Clubs and Marinas. A written request for private boat usage patterns was sent to area yacht clubs and marinas. Unfortunately, the response to this effort was dismal. We received responses from two yacht clubs and one marina. However, this added to our aggregate picture of the distribution of private boat usage.
- The Nature Conservancy (TNC) and the Professional Association of Dive Instructors (PADI). Data was also received from these organizations, however, because this data was in no way geo-referenced, it was not incorporated into the distribution estimation process.

As is mentioned above, none of these data sources could be used as a stand-alone source for the estimation of private boat activity distribution. However for each grid cell for which we had data, the data was entered and in the next two steps, the estimation of activity distribution was completed.

Step two involved extrapolating the existing data to the remainder of the study area. The assumption was made that the private boat activity distribution was approximately the same as charter/party boat consumptive activity. For each grid cell for which no data was available, the cell value was estimated using the following formula.

$$x=ay/b$$

where	x=	The grid cell value estimate for private boat usage grid cells containing no data from the above sources.
	a=	The equivalent grid cell value from the charter/party boat distribution for the grid cell missing private boat usage data.
	b=	The mean of grid cell values from the charter/party boat distribution for the grid cells containing private boat usage data.
	y=	The mean of grid cell values from the private boat distribution for the grid cells containing private boat usage data.

Step three involved fine tuning the distribution estimate based on the rough private boat data distributions. Although we may not have had a sufficient density of data to capture the distribution at the required one-by-one minute grid cells, we did have a rough geographic distribution of the data. In cases where this rough distribution suggested that the method in step two was incorrect, an adjustment was made to reflect the variance between the distribution of private boat and charter/party boat usage. For example, the yacht club and marina data clearly indicated that the private boat activity distribution was concentrated closer to the islands.

For private household boat fishing, 214,015 person-days of activity were estimated for the CINMS in 1999. For private household boat consumptive diving, 47,190 person-days of activity were estimated

Appendix B

for the CINMS in 1999. *Nonconsumptive activities from private household boats could not be estimated. There were no known sources of information.*

References

Leeworthy, Vernon R. and Wiley, Peter C. 2001a. *Data Distributions and Exclusion Zones: Commercial Fishing – Recreation*. Prepared for the Channel Islands National Marine Sanctuary, Marine Reserves Working Group. Socioeconomic Panel Report. National Oceanic and Atmospheric Administration, National Ocean Service, Special Projects Office, Silver Spring, Maryland. Can be found in portable document format (pdf) at <http://www.cinms.nos.noaa.gov/MRWGsocioec/panel.html>